Insider Trading Restrictions and Informed Trading in Peer Stocks[1]

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Abstract

Using a uniquely constructed dataset of trades by corporate insiders in all stocks, we find that insiders partially substitute trades in their own stock with informed trading in peer stocks after insider trading regulations become stricter. Further, insiders trade less profitably in their own stock and more profitably in peer stocks following the change. The common industry-wide information drives the increase in both probability and profitability of peer trades. Finally, for stocks with greater peer trading opportunities, stricter insider trading regulations reduce price informativeness without a corresponding improvement in liquidity, dampening the intended benefits of the insider trading regulation.

Key Words: Insider trading regulation, Informed trading, Industry information, Price informativeness, Liquidity

JEL Codes: D4, D82, G14, K22

1. Introduction

Insider trading laws are often justified using arguments of fairness and integrity of financial markets. Stricter insider trading laws can reduce adverse selection and improve liquidity in capital markets by limiting managers' ability to profit from their superior firm-specific information. Little is known about whether and how managers compensate for these lost trading opportunities. We examine whether managers, at least partially, substitute insider trades with profitable trades in peer firms based on their industry expertise.[2] If they do, such cross-trading by managers would change the composition of informed traders for any given firm. Specifically, while insider trades reduce, there will be an increase in informed trading by peer-firm managers. We examine whether the change in composition of informed traders has implications for stock price informativeness. Additionally, we investigate if the cross-trading by informed managers undermines the intended liquidity benefits of insider trading laws, by contributing to adverse selection in capital markets.

A significant challenge in addressing these questions is access to insiders' trades in peer-firm stocks since these trades are not disclosed. Further, a clean identification of the effect of insider trading laws requires significant changes in the regulation. To overcome the first challenge, we put together a novel dataset that allows us to identify insiders' trades in their own firms and peer firms. We match the reported trades of Indian corporate insiders with a proprietary dataset of all trades on the Bombay Stock Exchange (BSE), a major stock exchange in India. The BSE trade dataset has anonymized trader identifiers that allow us to track the same trader throughout our sample. The matching yields a final sample of 943 insiders

[2] Managers may avoid trading in peer stocks because (i) their information about peer stocks is not as precise as their insider information in their own stock and (ii) managers are already exposed to significant industry risk to their wealth and human capital.

corresponding to 17,367 trades in own stock and peer stocks, i.e., stocks in the insider-firm's industry, for the period 2012 through 2017.

To cleanly identify a shock to insider trading regulation, we exploit the 2015 Prohibition of Insider Trading Regulation (PITR) by the Securities and Exchange Board of India (SEBI). The 2015 PITR was adopted to overhaul insider trading laws and increase enforcement powers of SEBI and many of the changes were shaped by insider trading laws in the US and UK (Dey 2016). When the regulation came out, the financial news media described it as stricter than the older regulation and in line with global standards.[3] Using this regulation, we examine i) changes in trading behavior and profitability of trades by insiders in own stocks and peer stocks and ii) consequences of this change for price informativeness and liquidity in the market. Our tests involving insiders' trades in their own stocks provide further validation about the effectiveness of the new regulation.

Absent legal ramifications of insider trading, insiders would prefer to trade in their own stock, for which they likely have more precise information. But when stricter insider trading laws limit their ability to use their superior information to trade in their own stock, we conjecture that insiders are likely to apply their superior information to the next best use, i.e., trading in peer stocks. Additionally, after the regulation they would be less concerned about trading in peer stocks against better informed peer-firm's insiders because those trades of the peer-firm insiders in their own firm are also curtailed by the law. The combination of the limits to trading in own stock and the improved competitiveness of trades in peer stocks leads us to

[3] "Market regulator SEBI today notified a stricter set of insider trading norms to check illicit transactions in shares of listed firms by management personnel and 'connected persons'" Economic Times, Jan 15th, 2015. https://economictimes.indiatimes.com/sebi-notifies-stringent-insider-trading-norms/printarticle/45900478.cms accessed on April 24th, 2021. "The new regulations appear to be promising, more practical, and largely in line with the global approach to insider trading. They also seem to be equipped to ensure better compliance and enforcement." Mint, March 10th, 2015. https://www.livemint.com/Money/qMDHjPWNMJLza41fy8LWBO/What-Sebis-new-insidertrading-rules-mean-and-where-they-fa.html accessed on April 24th, 2021.

predict that insiders will substitute their own-stock-trades with peer-stock-trades. Figure 1 depicts the predicted change in informed trading in own and peer stocks. We define peer stocks as stocks in the same industry as the insider's own firm. Ben-David, Birru, and Rossi (2019) show that insiders trade profitably in stocks in their industry relative to firms in other industries. While insiders likely trade in peer stocks for various reasons even prior to the regulation, the insider trading restrictions create an additional reason to trade in peer stocks, i.e. to use the insider's information about their own stock.

Consistent with our hypothesis, we find that after the new regulation, the likelihood of own-stock-trades in a given quarter decrease, whereas the likelihood of peer-stock-trades increases. While we observe a reduction in the likelihood of own-stock-trades for low and high comovement firms, the increase in the likelihood of peer-stock-trades occurs only when the industry comovement is high, consistent with greater fungibility of the insider's information. Thus, the degree of substitution of peer-stock-trades for their own-stock-trades is driven by the industry information.

Next, we examine the profitability of insider trades in own and peer stocks. This analysis sheds light on the substitution of peer-stock-trades for own-stock-trades and highlights the trade-off between (i) exploiting more precise information about one's own firm at some legal and non-compliance risk and (ii) using noisier information about peer firms. We measure abnormal returns over 6-month horizons for each of the insider trades using size, book-to-market, and momentum-matched benchmark portfolios, following Daniel, Grinblatt, Titman, and Wermers (1997) and Wermers (2004). Controlling for insider fixed effects and clustering standard errors at the stock-trade date level, we find that overall DGTW adjusted returns for trades by insiders in their own stocks are significantly lower during the post-regulation period as compared to the returns in the pre-regulation period. This result, along with reduced probability of trade in own stocks, shows that the insider trading regulation is effective in

curbing informed trading in insiders' own stocks.[4] On the contrary, trading profits on peer firms increase post-regulation, suggesting that insiders use their superior information to trade profitably in peer firms.[5]

Further, we posit that insiders use information common to own and peer stocks to trade profitably in peer stocks. One source of such common information is industry information. We examine whether this source contributes to the profitability of peer trades using two alternative approaches. First, we use insider's own stock's comovement with the industry as a proxy for the fungibility of insider's information. We find that insiders earn abnormal profits on peer-firm trades only when industry comovement is high. In the second approach, we parse the overall abnormal profit from each trade into its two components – the average industry and the firm-specific components. We find that after the regulation, there is a decrease in the firm-specific component of insiders' profits in their own stock. This is consistent with insiders avoiding trades based on firm-specific news after the regulation. For peer trades, we expect that profitability after the regulation coming from the industry component of returns.[6] Consistent with this expectation, we find that the industry component of returns is significantly higher for peer firm trades after the regulation. Taken together, our results suggest that as insider trading regulation gets stricter, insiders use industry information to trade profitably in peer stocks.

The commonality of information between the own stock and the peer stock can go beyond the industry component. We capture it directly using pair-wise correlation over the pre-regulation period between an own stock and all the related stocks. As expected, the trades in

[4] In spite of the reduction, the return on own stock is positive and significant in both the pre- and post-regulation periods. This is consistent with Lorie and Niederhoffer (1968), Jaffe (1974b), Seyhun (2000), and Lakonishok and Lee (2001).
[5] Our inferences are similar when we use 3-month returns windows. The results are presented in Table A.7.
[6] To the extent that industry expertise enables insiders to predict how industry news affects different peer firms, some part of increased profitability of peer trades may also come from the firm-specific component of returns.

peer stocks highly correlated with own stock become more profitable after the change in regulation. Further, this improvement in profitability is entirely explained by the returns on a similar hypothetical trade in the own stock. The evidence about this pseudo-return on a trade forgone in own stock, provides strong support for the hypothesis that in light of stricter regulation, the insiders switch from own-stock trades to peer-stock trades to exploit their information advantage about the own firm.

It is worth noting that the opportunity for profitable peer stock trading was available to insiders even before the regulation and they would have continued such trading after the regulation. However, as we document, the increase in the profitability of peer stocks after the new regulation is driven by information about the own stock. Before the regulation, the best way for the insiders to exploit this information was trading in their own stock. Thus, after the stricter insider trading law, insiders increase their informed trading in peer stocks to take advantage of this information.

Cross-trading in peer stocks, triggered by insider trading laws, alters the mix of informed traders in any given firm. Specifically, for a given firm, insider trading reduces and informed trading by peer-firm managers increases. A natural question that follows is how the change in the mix of informed traders affects information flow to capital markets, information asymmetry, and stock liquidity. Thus, for our next set of analyses, we examine the effect of insider trading laws and the associated increase in cross-trading among peer stocks on price informativeness and liquidity in the stock market.

There is a longstanding academic debate on the pros and cons of insider trading laws that restrict insiders from using their superior information to trade in their own stock.[7] Insider

[7] See for example, Carlton and Fischel (1983), Leland (1992), Fishman and Hagerty (1992), among others. Bhattacharya (2014) provides a review of this literature.

trading restrictions typically trade off improved liquidity against reduced price informativeness (Leland, 1992). The arguments are based primarily on reduced insider trading. However, to the extent that insider trading is replaced by increased cross-trading, there is a change in the composition of informed traders in any given stock and the implications of stricter insider trading regulation for price informativeness and liquidity are no longer obvious. We consider each of these stock market attributes separately.

Insiders' trades in their own stocks and the disclosure of such trades can convey private information that may be otherwise difficult to credibly disclose to the market.[8] Thus, when insiders limit informed trading in their own stocks, there is a reduction in the price informativeness (Udpa 1996; Choi, Faurel, and Hillegeist, 2020). Hence, stricter insider trading laws make prices less informative. On the other hand, now there is possibly a greater number of informed traders (peer-firm managers). Then, through this channel, we expect the information to get incorporated into prices, improving the price informativeness (Holden and Subrahmanyam, 1992). It is worth noting that since trades by peer-firm managers are not required to be disclosed, the offsetting effect is likely to be weak. However, the incentives of outsiders for information acquisition may improve with stricter insider trading regulation, thus improving price informativeness. For example, see Fishman and Hagerty (1992) and Bushman, Piotroski, and Smith (2005). Thus, we empirically examine the net effect on price informativeness of these opposing forces.

At the same time, restrictions on insider trading reduces adverse selection concerns of outside investors, which improves liquidity (Leland, 1992). As in the case of price

[8] Meulbroek (1992), Cornell and Sirri (1992), and Chakravarty and McConnell (1997) show that prices move in the direction of the insider trade on days with insider trading, but Chakravarty and McConnell (1999) find no discernable difference in price movements to informed versus uninformed trades. To the extent the insiders have capital constraints and cannot trade until their private information is fully incorporated into the stock price, disclosure of the trades can convey additional information to the market. Indeed, Jaffe (1974b) and Brochet (2010) document a stock market reaction to disclosure of insider trades.

informativeness, there could be a dampening effect due to an increase in informed trades by peer firm managers. As a result, the adverse selection problem could persist even after the insider trading regulation. We thus predict that the liquidity gains from insider trading laws can be diminished as trades by peer-firm managers increase.

We study price informativeness and liquidity in a sample of firms for which we identified at least one insider. We define price informativeness as the sensitivity of stock prices to private information and consequently, if insider trades in a given stock reduce, less private information is reflected in prices during the quarter and public news events such as earnings announcements would convey more information to the markets at large.[9] We calculate the magnitude of information conveyed during earnings announcements using absolute cumulative abnormal returns (CARs) around earnings announcements. Controlling for earnings news, a higher value of this measure reflects lower price informativeness during the quarter. We find a significant increase in the absolute CARs during earnings windows after the regulation, making the prices during the rest of the quarter less informative. Interestingly, there is no incremental effect for firms with high comovement. This suggests that while there is greater cross-trading among peer firms when comovement is high, such trading is by itself not adequate to convey information and the lack of disclosure of these trades hurts the overall stock price informativeness.

We next examine the net effect of changes in the mix of informed traders on stock market liquidity. Using the Amihud (2002) measure of illiquidity for the firms of identified insiders, we find that liquidity improves for firms with low industry comovement. But this effect is significantly dampened for firms with high industry comovement because of greater cross-trading by peer-firm managers and this new class of informed traders (peer-firm insiders)

[9] Implicit in this conjecture is the assumption that there is a limit to how much news can be credibly conveyed through voluntary disclosures and that such disclosures cannot replace the information content of insider trades.

hurts market liquidity. The net effect is that, for high comovement firms, post comovement liquidity does not improve.

Our paper extends the literature on insider trading and more generally informed trading. Research on insiders' trades in other stocks is limited because such data is not readily available. A few recent studies innovatively capture insider trades in other stocks. Ben-David, Birru, and Rossi (2019) infer trades in other stocks by corporate insiders from a discount brokerage database and find that these insiders earn greater profits in stocks within their industry relative to stocks in other industries. Johannesson (2018) uses a database from Sweden to examine trades by insiders after they leave the company. Berkman, Koch, and Westerholm (2020) show that directors trade profitably in stocks where their fellow directors are insiders. Tookes (2008) finds indirect evidence of informed trading in competitors of a firm around its earnings announcement. Similarly, Mehta, Reeb, and Zhao (2020) find that around news events of a firm, informed trading increases in the firms that are economically linked to that firm and the authors attribute these effects to shadow trading.[10] In contrast, we provide *direct* evidence on the partial substitution of trades by insiders. Our novel data with trades by identified insiders in own and peer stocks around a shock to insider trading regulation, we show that, when faced with stricter insider trading regulation, the corporate insiders shift their informed trading away from their own stock and towards other stocks in the same industry. Further, we shed light on the different sources of profitability of peer trades.

A small but growing literature assesses how insiders change their trading behavior in response to changing regulation, enforcement, or legal risk. Del Guercio et al. (2017) provide evidence consistent with the interpretation that the SEC enforcement resources deter illegal insider trading. Adhikari, Agrawal, and Sharma (2019) document that a decrease in the risk of

[10] Coming at the question of insider trading from a different angle, Alldredge and Cicero (2015) look at insiders trading in their own stock but based on information spillover from connected firms.

lawsuits by shareholders is followed by insiders trading more profitably in their own stocks. Kacperczyk and Pagnotta (2020) show that insiders trade less aggressively in their own stock when facing higher legal risk. We contribute to this literature by showing that, in response to insider trading restrictions, insiders substitute informed trading in peer firms for trading in their own stock.

We also contribute to the literature on the effectiveness of insider trading regulation. See Jaffe (1974a), Seyhun (1992), Bhattacharya and Daouk (2002), White (2020), among others. We document that insider trading regulations do not completely prevent insiders from profiting from their superior information; they only prevent them from doing so in their own stock. We also document that in the presence of peer trading, stricter insider trading laws may not produce the desired benefits of improved liquidity.

Next, we describe the institutional background for our study.

2. Institutional Background

2.1 Insider Trading Regulation in India

The Securities and Exchange Board of India (SEBI) is the securities regulator in India and has the power to make regulations consistent with the objectives of the Securities and Exchange Act of 1992. The SEBI first addressed insider trading regulation in the (Prohibition of) Insider Trading Regulations of 1992. After a series of minor amendments in 2002, 2003, 2007, 2008, and 2011, it decided to overhaul and update the regulation and a new regulation, the Prohibition of Insider Trading Regulations, 2015, was drafted to "put in place a framework for prohibition of insider trading in securities and to strengthen the legal framework thereof."[11]

[11] Shroff (2015) has a detailed discussion on the introduction of the 2015 Regulations. https://xbma.org/indian-update-new-insider-trading-laws-in-india-how-much-is-too-much/ retrieved on October 20, 2020.

The Companies Act of 2013, which aimed to improve corporate governance in India, delegated the power to prosecute insider trading in listed and to-be-listed companies to the SEBI. The Sodhi Committee, under the chairmanship of former Chief Justice N. K. Sodhi, was set up in 2013 to review the Prohibition of Insider Trading Regulations of 1992. The committee made "a range of recommendations to the legal framework for prohibition of insider trading in India and has focused on making this area of regulation more predictable, precise and clear by suggesting a combination of principles-based regulations." SEBI adopted the new regulation on January 15, 2015.

Some of the key changes made by the 2015 regulation were (i) Requirement that companies designate a compliance officer who reports to the board. The compliance officer is charged with ensuring compliance with insider trading policies and procedures and ensuring adherence to the regulation. This put the burden on the firm and board to ensure compliance with the regulation. (ii) Clarification and expansion of the scope of an insider, defined as a connected person or anyone who could have access to unpublished price sensitive information (UPSI) regardless of the source of information (iii) Introduction of the option of trading plans for insiders who may have continuous access to UPSI (iv) Requirement that every company formulates and publishes on their website a code of conduct for the handling of UPSI and establish a trading window for trading in the company's securities (v) Addition of the provision that SEBI could take action against any violation of the regulations, simplifying a previously lengthy and ineffective process. Overall, the Prohibition of Insider Trading Regulations, 2015, was designed to address widespread insider trading by requiring greater compliance and monitoring while increasing the burden of proof on the alleged insider.

Thus, the insider trading law was significantly strengthened in 2015 and the onus of enforcement partially shifted to the company, making the restrictions more effective. As noted in the introduction, the financial news media did perceive the new regulation to be stricter and

more in line with the global standards. Still, one potential concern is the lack of enforcement of insider trading laws in developing economies and Bhattacharya and Daouk (2009) argue that no insider trading law is better than unenforced laws. While they document several countries with no enforcement despite having insider trading laws, they report that the first insider trading enforcement action in India occurred in 1998. We also verify that there was continued enforcement during our sample period. The SEBI publishes its enforcement actions on insider trading in its annual reports and during our sample period, the number of new investigations initiated ranged from 10 to 34 per year. Insider trading enforcement actions tend to be rare even in developed economies and thus this evidence provides us assurance that there is some degree of enforcement of insider trading in India.

Further, the effectiveness of the law can be gauged by the change in behavior of the insiders. As we document in our tests, the insiders' trades in their own stocks did become less frequent and less informed after the new regulation. This provides additional validity that the change in the regulation did have teeth.

2.2. Stock Exchanges

India has two major stock exchanges, the Bombay Stock Exchange (BSE), established in 1875, and the National Stock Exchange (NSE), established in 1992. The BSE is the largest securities market in India with over 5,000 companies listed on it and the NSE has almost 2,000 stock listed on it. While BSE has more stocks listed, the volume of shares traded tends to be higher on NSE. Most brokers are members of both the BSE and NSE and thus, for firms listed on both exchanges, investors have the option of trading on either exchange.

Insiders are required to disclose insider trades to the stock exchange(s) within 2 trading days, and the exchanges are required to make these filings available on their website. This is the primary source of the insider trading data that we use in our study.

3. Data

Our broad approach to constructing the sample involves matching the reported insider trades to a detailed transaction level dataset from the BSE. We first describe the reported insider trade data, then the BSE Trade Data, then the sample period, and finally the matching process.

3.1 Insider Trading Data

Existing insider trading regulation mandates that directors, officers, and substantial shareholders in a listed Indian company report the trades that exceed Rs. 500,000 (about $6,700) in value or 25,000 shares or 1% of the total shareholding in the stock of that company, to the stock exchange(s). We obtain these filings from the Prowess database by the Centre for Monitoring the Indian Economy (CMIE). The disclosure includes the date of the transaction, insider's name, stock identifier, mode of acquisition or sale, and the number of shares transacted. The filings can pertain to transactions other than a trade on an exchange such as allotment of shares under employee stock ownership plans, off-market transactions, and exercise of employee stock options. We only retain the insider-reported trades executed on the secondary market.[12] This results in 68,983 distinct insider-reported transactions – 19,583 purchases and 49,220 sales, corresponding to 12,890 insiders, from the year 2012 through 2017.

3.2 BSE Trade Data

We use a proprietary dataset that covers all the trades that have been executed on the BSE over a period of six years, from 2012 to 2017. The details include the date of the trade, stock identifier, number of shares, trade price, broker identifiers (IDs), and trader (broker's client) IDs for both sides of the transaction (buy and sell). Every broker assigns a unique ID to

[12] The SEBI mandates that an insider trading in the stock of their own firm reports the trade to all the exchanges on which their own firm's stock is listed.

each of their clients, and thus, we can uniquely identify a trader for all trades executed through a given broker based on the broker ID - client ID pair. The client and the broker IDs are anonymized but stay constant for a given broker and client for the entire period. Thus, to the extent an investor trades through the same broker, we can track her entire trading activity on the BSE for our sample period. This feature is particularly valuable as it allows us to match insider trades more accurately to a trader, which is not possible using typical publicly available transaction databases that contain no identifiers for the trading parties. For example, Inci, Lu and Sehyun, 2010, use the TAQ data to match to the reported insider trades.

3.3 Sample Period

We utilize the 2015 Prohibition of Insider Trading Regulation by the Securities and Exchange Board of India (SEBI) to cleanly identify a shock to insider trading regulation. Though the regulation was adopted on January 15, 2015, the Companies Act of 2013 enumerates the provision for insider trading restriction (without providing explicit guidelines for it). Also, following the Companies Act of 2013, the draft rules were published, and public comments were solicited before the law was finally adopted on January 15, 2015. Hence, we view the period between September 12, 2013 (the effective date for the Companies Act) and January 15, 2015 (adoption of the Insider Trading Regulation, 2015) as a transition period with significant regulatory uncertainty and we eliminate it from the analysis. In summary, the pre-regulation period spans from January 1, 2012, through September 12, 2013, and the post-regulation period spans from January 15, 2015, to December 31, 2017. We conduct robustness tests by changing the transition period. We discuss these in Section 4.4.4.

3.4 Sample Construction

To identify potential insiders in the BSE Trade Dataset, we begin with the reported insider trades during our sample period, and for every insider trade on a given date, we identify

all the traders in the BSE data that have traded in the insiders' own firm on that reported date. For each of these traders, we separately aggregate the number of shares bought and the number of shares sold on that transaction day. We aggregate the shares at a daily level for a trader to account for the possibility that a trade may be split during execution, but the insiders report the total number of shares traded in the filings.

The idea is to match an insider (who reports trades) uniquely to a trader account in the BSE trade data and be reasonably confident that the account belongs to the insider. The process involves uniquely matching a reported trade to a BSE trade based on the date of the transaction, stock identifier, number of shares transacted, and direction of the trade (acquisition or sale). Such a matching process often results in a single reported insider trade being matched to multiple trades in the BSE Trade Dataset. This usually occurs when the insider's trade is a round-lot trade and a popular trade size for many traders on that date.[13]

To enable a unique match between an insider and a BSE trader, we, therefore, focus our attention on insiders with at least two reported trades with at least one of them being an odd-lot trade during the sample period. This yields a sample of 6,293 insiders, corresponding to 56,486 trades. The matching process is executed in two stages. In the first stage, we only consider the odd-lot trades and try to match them to a trader account in the BSE trade data. At this stage, there are three possible outcomes: a reported insider trade i) matches uniquely to an account, ii) matches to multiple accounts, or iii) does not match to any trading account.[14] In the case of outcomes (ii) or (iii), we drop that insider trade from the matching process. In case of

[13] We consider frequently traded transaction volumes as round lots. Specifically, we categorize an insider trade as a round lot trade if the aggregated transaction volume in a day is 150,250, 1500, 2500, 15000 or 25000 or is a multiple of 100 (between 100 to 1000 e.g., 100, 200 etc.) or a multiple of 1000 (between 1000 to 10000 e.g., 1000, 5000 etc.) or a multiple of 10000 (e.g.,10000, 50000, etc.). Non-round lot trades are considered as odd-lot trades.
[14] The insider trades may not match with any account primarily because of two reasons- (i) the insider split the trade across multiple accounts or (ii) the trade is not executed on the BSE. The second scenario is likely because Prowess dataset provides the name of the exchange on which the insider trade was *reported* but does not specify the exchange on which it was *executed*.

a unique match, i.e., outcome (i), we consider the trader account in the BSE data as a potential insider account and this insider- trader account pair is analyzed further in the next stage.[15]

In the second stage, we require that an insider with a "potential insider account" matches uniquely to the same account for at least one more reported trade. In case of a unique match again, we attribute the trader account in the BSE data to the corresponding insider. Overall, the two-stage process ensures that an insider matches uniquely to an account at least twice and at least one of those unique matches is for an odd-lot trade. This gives us further confidence in the insider- BSE trader account match.

Table 1 reports the descriptive statistics of reported and matched trades. Overall, we match 11,090 reported trades and 1,312 reporting insiders to an account in the BSE data. Once a trader account in the BSE data is mapped to an insider, we extract all trades executed through this account, enabling us to identify trades by insiders in stocks other than their own. Next, we obtain the financial data and stock returns for the own stocks and peer stocks from CMIE's Prowess database. We define peer stocks as stocks in the same industry as the insider's own firm. We evaluate the profitability of the trades using 6-month buy and hold returns for each own and peer-stock-trade through insider accounts. The trades with missing returns are dropped from the sample. Lastly, we exclude the insiders in the finance industry from the sample. Finance industry insiders are likely to possess broad inter-industry information due to lending relationships. Unlike insiders in other industries, they may use their superior private

[15] Despite a unique match between insider and BSE account, there is a likelihood that the insider trade was executed on another exchange and happened to match exactly with another trade executed on BSE. To alleviate concerns about inaccurate mapping of the insider and her account we perform additional analysis in the second stage.

information to trade more broadly, i.e., in non-peer firms. After these steps, we have 943 insiders with 17,367 total trades- 13,912[16] in their own stocks and 3,455 in peer stocks.[17]

4. Probability and Profitability of Insider Trades

We conduct two broad categories of tests to examine the change in behavior by corporate insiders following the change in regulation: (i) evaluation of the likelihood of an insider trade in own versus peer stock and (ii) examination of the profitability of insiders' own and peer-stock-trades. Further, we investigate the role of the fungibility of information in the changing behavior of insiders. We describe these tests and results in this section.

4.1 Likelihood of Own- and Peer-Stock-Trades

Are insiders more or less likely to trade in their own firm's stock and peer stocks after the new regulation? We examine this using insider- insiders' own firm-announcement-quarters as our unit of observation. A firm-announcement-quarter for each firm is measured from the previous earnings announcement date +2 to the current quarter earnings announcement date +1. We examine the likelihood of a trade in own and peer stocks by estimating the following linear probability model.

$$\text{Own-Stock-Trade}_{(1,0)ijt}\,(\text{Peer-Stock-Trade}_{(1,0)ijt}) = \alpha + \beta_1\,\text{Post}_t + \varepsilon_{ijt} \qquad (1),$$

where $\text{Own-Stock-Trade}_{(1,0)ijt}$ $(\text{Peer-Stock-Trade}_{(1,0)ijt})$ is an indicator variable that equals 1 if an insider j of firm i trades in her own stock (a peer stock) during a given earnings announcement quarter t of firm i and zero otherwise. Post is an indicator variable that equals 1

[16] This number includes smaller trades identified from the BSE Trade Data that are not required to be reported and hence is larger than the number of reported trades matched to the BSE Data.
[17] The identification of peer depends on the industry classification. Prowess has a finer classification and a coarser classification, analogous to the 4-digit versus 2-digit SICs. We chose to define peers based on the finer industry classification in Prowess. While we identify fewer peer in the finer classification, these peers are more similar and therefore industry information is more transferable, an important attribute for our setting.

during the post-regulation period and 0 otherwise. We use either industry or insider fixed effects.[18]

It is important to caveat that (i) our data does not include trades by a given insider that were executed on the National Stock Exchange (NSE) since we only have access to the BSE trades, and (ii) we do not include trades executed on the BSE by a given insider with another broker if we did not match that broker-client pair to the insider at the matching step. We do not expect these exclusions to bias our results since there is no reason for insiders to systematically change their trading behavior between exchanges and brokers in different ways for their own stocks and peer stocks around the regulation. Therefore, while we do not look at a comprehensive set of insider trades, we study a comparable subset of trades by insiders in the pre- and post-regulation periods. This is similar to the setting in Ben-David, Birru, and Rossi (2019), who examine insiders' trades executed through one large discount broker.

Table 2 presents the results of the estimation of Equation (1). Columns (1) and (2) have specifications with industry fixed effects. We find that β_1 is -0.0372 and significant for the likelihood of insider trades in their own stock. On the other hand, when we examine the likelihood of insiders' peer-stock-trades, β_1 is +0.0091 and significant. This suggests that insiders are less likely to transact in their own stock but more likely to trade in peer-firm stocks when they face stricter insider trading regulation. The pre-period probability of insider trade in own stock is around 0.17 and in peer stock is 0.046. Thus, the likelihood of trades by firm insiders in own stocks (peer stocks) reduces (increases) by about 22% (20%), an economically meaningful magnitude. We find very similar results in direction and magnitude in Columns (3)

[18] According to Wooldridge (2002), the linear probability model is often a good approximation. The case for it is stronger when the explanatory variables are all indicator variables and the specification has a large number of fixed effects, as is situation here. Wooldridge further notes the problems associated with probit with fixed effects (computational difficulty and inconsistent estimates) and logit with fixed effects (difficulty in estimating partial effects). See discussion in Chapters 15.2, 15.8.2, and 15.8.3 in Wooldridge (2002). Based on these considerations and for ease of interpretation, we use the linear probability model as our estimation method. However, we get similar results using the logit model.

and (4) which include insider fixed effects. Thus, even after controlling for each insider's propensity to trade, we find that the probability of trading shifts from own stocks to peer stocks after the new regulation.

Since the likelihood of a trade in peer stocks depends on the availability of relevant information about peer stocks, we predict that the increase in peer-stock-trades will be greater for insiders with more fungible information. We construct a measure of comovement of insider's own stock's returns with the returns of the remaining firms in the industry by adapting the Piotroski and Roulstone (2004) synchronicity measure. We regress the firm's weekly stock returns on the current and prior week's value-weighted industry returns (excluding the firm's returns). The firm-specific measure of comovement is defined as the log of the ratio of R-square and (1-R-square) obtained from the regression. We calculate it for insiders' own firms during the pre-regulation period and we use this throughout the sample. We assign an indicator variable, High_Comove, a value of 1 if the pre-period comovement of insider's own firm is above median and 0 otherwise.

We add High_Comove to Equation (1) and interact it with Post. We use only industry fixed effects in this specification and not insider fixed effects because comovement is measured for an insider's own firm using the pre-regulation period. Given that the vast majority of the insiders have only one own firm, there is not enough variation in comovement within insiders. For a related trade by an insider with multiple own firms, we pick the highest value of comovement and corresponding High_Comove across all the own stocks of that insider. These results are in Table 3. When comovement is high, there is a higher likelihood of a peer trade before the regulation (the coefficient on High_Comove is 0.03, which is significant at the 1 percent level) and there is a further incremental increase in this likelihood after the regulation. The coefficient of Post X High_Comove is positive and significant, and so is the sum of coefficients on Post and Post X High_Comove. At the same time, we find no difference in the

likelihood of trading in own stock when the own stock comoves more with the industry. Although the coefficient for Post X High_Comove for Own-Stock-Trade is negative it is insignificant. This is consistent with our prediction that insiders are more likely to trade in peer stocks, particularly when their private information is more fungible.

4.2 Profitability of Own- and Peer-Stock-Trades

To evaluate the profitability of trades executed by insiders in their own stock and peer stocks, we calculate abnormal returns for each trade using the approach in Daniel, Grinblatt, Titman, and Wermers (1997) (with the modifications specified in Wermers, 2004). Specifically, we construct 125 portfolios by sequentially sorting the universe of the stocks based on quintiles of log market capitalization, book-to-market ratio, and momentum. Next, the DGTW-adjusted return for a stock is calculated as the stock's 6-month buy-and-hold return less the buy-and-hold return for the value-weighted DGTW portfolio to which the stock belongs. We calculate the industry-specific component of abnormal return for a stock as the market capitalization-weighted average of all DGTW-adjusted returns for all the stocks in that industry. The firm-specific component is the stock's DGTW-adjusted return minus the industry DGTW-adjusted return described above. The returns are winsorized at 0.01 and 99.99 percentiles.

We first examine the univariate returns for the insider trades in own stock and peer stocks in Table 4. Consistent with Krishnan and Rangan (2016), we find that overall, insiders trade profitably in their own firm stocks during the pre-period. Table 4 has three main insights relevant to our questions. First, the profitability of an average peer-stock-trade in the post-period increases by 4.63 percentage points relative to the pre-period. Second, the own-stock-trades are significantly more profitable than peer-stock-trades in the pre-period, indicating that insiders use their private information to trade in their own stock before the new regulation.

Third, though own-stock trades continue to be profitable on average in the post-regulation period, the difference in the profitability of own and peer-stock-trades is no longer statistically significant. In summary, the univariate returns comparison provides initial evidence supporting the conjecture that insider shift their informed trading from their own stocks to peer stocks following stricter insider trading regulations.

We then examine the DGTW-adjusted 6-month returns of insider trades in a regression and compare the profitability of trades in peer versus own stocks in the pre- versus post-regulation periods using the following specification.

$$\text{DGTW Adj Returns}_{ijt} = \alpha + \beta_1 \text{Own\_Stock}_{ij} + \beta_2 \text{Post}_t + \beta_3 \text{Post}_t \text{ X Own\_Stock}_{ij} + \varepsilon_{ijt} \qquad (2),$$

where $\text{DGTW Adj Returns}_{ijt}$ is the abnormal buy-and-hold return over 6 months for a trade executed by insider j in stock i on date t. Own_Stock_{ij} is an indicator variable equal to 1 if stock i is insider j's own firm. We include industry or insider fixed effects and the standard errors are clustered at the traded stock-trading date level. The profitability of peer trades in the pre-period is subsumed in the intercept. β_1 captures the incremental profitability for own stocks relative to peer stocks in the pre-regulation period. β_2 captures the incremental profitability on peer stock in the post-regulation period relative to the pre-period. Our conjecture is that if insiders channel their private information towards peer-stock-trades to avoid scrutiny, then β_2 should be positive and significant. β_3 captures the incremental effect of the regulation on own stocks relative to peer stocks.

We present the results in Table 5. We find that β_1 is positive and significant at the one percent level, suggesting that in the pre-regulation period, insiders earned significantly higher profits on their trades in their own stock relative to peer stocks, even after controlling for industry or insider fixed effects. The coefficient of Post is in the range of 2.8% - 4.2% return over a six-month period, which is considerable. It is also a sizeable improvement given that the

pre-period profitability of peer stocks is -2.5% (Table 4). Thus, consistent with our prediction, the profitability for peer stocks increases after the regulation, suggesting that insiders are using their private information and industry expertise to make profitable trades in related stock. On the other hand, the coefficient for Post X Own Stock is negative and significant implying that relative to peer stocks, there is a decrease in profitability of own-stock-trades in the post-period. The overall profitability of own-stock-trades (β_2+ β_3) does not go down after the regulation when we have industry fixed effects. But it does go down significantly once we control for insiders' skill via insider fixed effects.

Next, we explore whether the increased profits in peer stocks arise because insiders can apply their superior industry information to trade in peer stocks. We take two approaches to establish this: a) use of industry comovement of insider's own stocks and b) decomposition of profitability into industry and firm-specific components.

For the first approach to examining the role of information commonality, we conjecture that the insider's private information is more value-relevant for trading in peer firms, i.e., it is more fungible when their own stock comoves more with the industry. We include the indicator for high comovement, High_Comove, and interact it with each of our variables in Equation (2). The results are reported in Table 6. The coefficient on Post captures the increase in profitability for peer-stock-trades by insiders with less fungible information. It is positive but insignificant. However, the change in profitability for peer-stock-trades by insiders with more fungible information is captured by the sum of coefficients on Post and Post X High_Comove. The F-test for the sum of coefficients is significant at the one percent level, as predicted. This, combined with the evidence in Table 3 that insiders are more likely to trade in peer stocks when their own stock has high comovement with the industry, points to additional profit-making opportunities for the insiders when the information is fungible.

In the second approach, we examine the changes in profitability around the regulation coming from industry and firm-specific components of returns. If the insiders are trading in peer-stocks based on industry information, we expect the industry returns on the peer trades to improve after the regulation. Additionally, industry expertise can also result in profitability coming from firm-specific returns since these experts would know the competitive advantages of various firms within the industry, allowing them to assess differential impact of industry news on individual firms within the industry. The industry component of abnormal returns for a given insider trade is computed as the value-weighted DGTW adjusted returns for all stocks in a given industry for the 6-month period starting on the date of a given insider's trade. The firm-specific component, therefore, is the firm's DGTW adjusted return less the industry component. We run the specification in Equation (2) with these separate components as dependent variables with either industry or insider fixed effects. The results are reported in Table 7. Columns (1) and (3) report the results for the industry component of returns and Columns (2) and (4) for the firm-specific returns. For peer-stock trades, there is a significant increase in the industry component of the returns, but not firm-specific return as seen from the coefficient for Post. These results are consistent with insiders using industry information to trade in these stocks after the regulation, in line with the findings of Ben-David, Birru, and Rossi (2019). There is a significant reduction in the firm-specific component in own stock trading profits across both specifications. β_3, as well as $\beta_2 + \beta_3$, are negative and significant at the 1% percent level, indicating that insiders reduce the use of firm-specific information while trading in their own stock. This is consistent with the objectives of the insider trading law. Interestingly, however, the industry component returns of own trades increases after the regulation with both β_3 and $\beta_2 + \beta_3$ positive and significant. These results suggest that after the new regulations, insiders alter the type of information they use for their trades, relying more

on the industry component of their information and scaling back on using the firm-specific news even while trading in their own stocks.

Overall, the results in Tables 3, 6 and 7 suggest that industry information contributes to insiders trading profitably in peer stocks after the regulation.

4.3. Trades in correlated peer-stocks

After the new regulations, if the insiders are using information about their own stock to trade profitably in peer stocks, we expect the profitability to be stronger for peer stocks that are highly correlated with the insider's own stock. To examine this possibility, we calculate pairwise correlation between each insider's own stock and peer stocks. Then we run the following specification for all the related stock trades:

$$\text{DGTW Adj Returns}_{ijt} = \alpha + \beta_1 \text{ High\_Pairwise\_Corr}_{ij} + \beta_2 \text{ Post}_t + \beta_3 \text{ Post}_t \text{ X High\_Pairwise\_Corr}_{ij} + \varepsilon_{ijt} \quad (3).$$

where $\text{High\_Pairwise\_Corr}_{ij}$ is an indicator that is 1 if the pairwise correlation, in the pre-regulation period, between the weekly returns of own stock of insider j and peer stock i is above the median pairwise correlation and 0 otherwise.[19] For a related trade by an insider with multiple own firms, we pick the highest value of pairwise correlation and corresponding High_Pairwise_Corr across all own stocks of that insider. These results for Specification (3) are in Column (1) of Table 8. As expected, we find that the improvement in profitability of related trades is driven by peer stocks that are highly correlated with insider's own stock. β_3 as well as $\beta_2 + \beta_3$ are positive and significant at 1%.

Our argument that insiders, at least partly, substitute informed trading in own stock with that in peer stocks in response to stricter insider trading regulations implicitly assumes

[19] We use the pre-period pairwise correlation and not a time-varying measure of correlation because changes in the insider trading behavior may alter the pairwise correlation between own stock and peer stock in the post regulation period.

that, in the absence of regulation, insiders' dominant strategy for profit maximization is to trade in their own stocks using their precise information.

To examine this possibility, for each peer-firm trade by insiders we calculate "pseudo" return as the return of a hypothetical trade in insider's own stock on the same date and in the same direction (buy/sell) as the peer-firm trade and use the following specification:

$$\text{Pseudo Own-Stock Ret}_{ijt} = \alpha + \beta_1 \text{ High\_Pairwise\_Corr}_{ij} + \beta_2 \text{ Post}_t + \beta_3 \text{ Post}_t \text{ X High\_Pairwise\_Corr}_{ij} + \varepsilon_{ijt} \quad (4),$$

where, Pseudo Own Stock Ret_{ijt} is evaluated as the 6-month buy and hold DGTW adjusted returns for a hypothetical trade in stock i by insider j in their own firm on date t. The other variables are as defined before and summarized in Appendix A.

The results are reported in Column (2) of Table 8. We expect that the insiders' *hypothetical* trade in own stock is profitable, when the own stock and the peer stock are highly correlated. Consistent with this prediction, the coefficient for Post X High Pairwise Corr and the sum of coefficients of Post and Post X High Pairwise Corr are positive and significant. Comparing the magnitude of coefficients β_3 as well as $\beta_2 + \beta_3$ across Columns (1) and (2), we see that the bulk of improvement in profitability of highly correlated stocks is explained by pseudo own-stock return, the profitability of the foregone trade.

Does information about the related stock itself play a role in the profitability of the related stock trades? To dig deeper into this phenomenon, we also run the following specification:

$$\text{Remainder Peer Ret}_{ijt} = \alpha + \beta_{12} \text{ High\_Pairwise\_Corr}_{ij} + \beta_{22} \text{ Post}_t + \beta_{32} \text{ Post}_t \text{ X High\_Pairwise\_Corr}_{ij} + \varepsilon_{ijt} \quad (5),$$

Where Remainder Peer Ret_{ijkt} is the difference between actual 6-month buy and hold DGTW adjusted return of the trade in peer stock i of insider j and Pseudo Own Stock Ret_{ijt}.

We present these results in Column (3) of Table 8. This related-stock-specific component, does not provide any significant contribution to the increased profitability of the peer-stock trades post-regulation. Taken together the evidence in the three columns of Table 8 indirectly supports the argument that when faced with stricter insider laws, insiders switch from profitable trading in own stock to profitable trading in peer stocks that are highly correlated with own stock. In the absence of restriction, they could have profitably traded in the own stock.

It is important to highlight one assumption underlying the analysis in this subsection. While calculating the pseudo own-stock returns, we have assumed that the best hypothetical trade in the own stock, in absence of stricter regulation, would have been one identical to the trade in the peer stock. But if the insiders were to take advantage of their information, by trading their own stock, they might have structured their trade differently to make the best use of their information in that situation. Thus, the pseudo return we calculate provides a lower bound on the profitability of the trade foregone in own stock. Based on this lower bound, our evidence suggests that the foregone trades in own stocks would have been no less and potentially more profitable than the actual trades in peer stocks. Thus, the evidence supports the argument that that faced with stricter insider trading law, insiders switch from trading in own stock to trading in peer stocks *using the information about their own stock*.

4.4 Robustness Tests

4.4.1. Trading around earnings announcements

Is insiders' change in trading behavior in response to change in the regulation particularly salient before earnings announcements? Mehta et al. (2020) find increased levels of informed trading in connected firms before a firm's earnings announcement. Thus, given the evidence in Section 4.3 it is possible that insiders use earnings-related information about their own firms to trade in peer stocks. On the other hand, the insiders' industry expertise as

well as a more general information overlap between the own and the peer firms, could allow them to trade more profitably in peer stocks all through the year. To examine both these possibilities, we split an earnings announcement quarter of each insider's own firm into two periods, (i) a high earnings-information period: t-10 days to t+1 days around the earnings announcement t, and (ii) low earnings-information period: the remaining days in the earnings announcement quarter. We reexamine profitability of trades using Equation (2) separately for these two periods. The results in Table A.1 in the Online Appendix show that the insider trades in peer stocks improve in profitability after the regulation in both the periods, but magnitude is larger in the high earnings-information period. Thus, while insiders' information advantage in the peer stocks is stronger for earnings related information it is not limited to that type of information.

4.4.2 Trading in non-peer stocks

So far, we have established that following more stringent insider trading regulations, insiders trade more profitably in peer stocks. But are these results specific to peer stocks or to *all* stocks other than insider's own stock? To examine this possibility, we extract all the trades by the matched insiders in the stocks other than their own and peer stocks- non-peer stocks. There are 88,078 such trades in our sample, making the total number of trades (own + peer + non-peer) 105,445. We investigate if insiders make abnormal profits in their non-peer-stock-trades by running the following specification similar to Equation (2) using all trades by insiders:

$$\text{DGTW Adj Returns}_{ijt} = \alpha + \beta_1 \text{Own\_Stock}_j + \beta_2 \text{Post} + \beta_3 \text{Post X Own\_Stock}_j + \beta_4 \text{Peer\_Stock} + \beta_5 \text{Post X Peer\_Stock}_j + \varepsilon_{ijt} \quad (6).$$

Here, the pre-period profitability of non-peer stocks is subsumed by the intercept. β_1 and β_4 capture the incremental profitability of own and peer stocks, respectively, relative to the

non-peer stocks in the pre-period. Table A.2 shows the results. Coefficient β_2 is positive and statistically significant, indicating that the profitability of non-peer stock does go up after the regulation. But coefficient β_5 tells us that, relative to non-peer stocks, there is an incremental and statistically significant increase of about 4 percentage points in the profitability of peer stocks.

Further, we decompose the profitability into the industry and firm-specific components in Table A.3. We see that the increase in profitability of non-peer trades is coming exclusively from firm-specific component – around 50 to 60 basis points – as indicated by the coefficient for Post in Columns (2) and (4). On the other hand, the rise in profitability of peer stocks (Post + Post X Peer Stock in Columns (1) and (3)) is coming solely from the industry component. It is also around 250 to 300 basis points, which is 5 times as large as the effect for non-peer stocks. Thus, the insider may have some private information about some non-peer firms, which is unrelated to the industry component. But their informational advantage in non-peer stocks is much smaller compared to the one in peer stocks. Similar to the results in Table 7, we find that the industry component of profit of own-stock-trades goes up while the firm-specific component goes down.[20] Taken together these results bolster our earlier conclusions that, after the regulations, (i) insiders reduce the use of firm-specific private information for trading in their own stock; and (ii) they move to using common industry information for trading in their own and peer stocks.

4.3.3. Governance as an alternative explanation

Around the period of the insider trading regulation, the Companies Act of 2013 required all firms to have independent, diverse boards. An alternative explanation for our

[20] Prior to the change in regulation, the industry component of returns is lower for peer stocks compared to non-peer stocks, consistent with the insiders' need for hedging their own industry risk but not that of non-peer stocks.

results is that the improved corporate governance, due to better board monitoring, restricted insider trading (Dai et al., 2016; Ravina and Sapienza 2010, Cziraki et al., 2014, Jagolinzer et al. 2011). To examine any possible confounding effects of governance changes, we re-estimate Equation (2) in a sample of firms that had strong boards, proxied by board independence, throughout the sample period. This sample includes 53 insiders with 899 trades and the results are reported in Table A.4. Similar to the results in Tables 5 and 7, there is a significant increase in peer-stock-trade profitability and a reduction in profitability of insider trades in own stock. Further, like the whole sample, the industry component of profitability increases for peer-stock-trades (coefficient for Post) as well as own-stock-trades (Post + Post X Own_Stock) and the reduction in own stock profitability is driven by the firm-specific component of returns. Despite the small sample, these results are largely consistent with the results in the whole sample. Therefore, we are reassured that the results are not entirely driven by concurrent changes in governance-related regulations and can be interpreted as a consequence of the insider trading regulation.

4.4.4 Alternative transition windows delineating the pre- and post-regulation periods

To address concerns about sensitivity of our results to the transition window, we re-examine the probability and profitability of insider trades using two alternative transition windows. First, we examine the effects using an extended transition window i.e., we consider the sample period between the effective date of Companies Act of 2013 (September 12, 2013) and the effective date of the Prohibition of Insider Trading Regulation (May 15, 2015) as the transition window. Specifically, the period after May 15, 2015 is considered as the post-regulation period and period before September 12, 2013 is considered as the pre- regulation period. Second, we do not use a transition window i.e., the period after January 15, 2015 is considered as the post-regulation period and the period before January 15, 2015 is considered as the pre-regulation period. We evaluate Equation (1) and Equation (2) with the two alternative

definitions for *Post*. Our results are robust to these alternative transition windows and are presented in Table A.5 and Table A.6. As in Table 2, we find in Table A.5 that the after the regulation, the likelihood of own-stock-trade goes down and that of peer-stock-trade goes up. Further, the profitability results in Table A.6 are similar to those in Table 7. Thus, it is a robust inference that, in the face of stricter insider trading regulation, insiders move their informed trades from own stock to peer stocks.

4.4.5 Alternative return horizons

The profitability tests presented earlier evaluate profitability of insiders' trades over a horizon of 6 months. To address potential concerns about the sensitivity of our results to this holding period horizon, we evaluate the Equation (2) with abnormal buy-and-hold return and its industry and firm-specific components over 3 months as the dependent variable. The results presented in Table A.7 are similar to those in Tables 5 and 7 that after the regulation a) profitability of own-stock-trades go down, particularly driven by the firm-specific component and b) the overall profitability and the industry component of the peer-stock-trades goes up.

5. Price Informativeness and Liquidity

The results so far demonstrate that owing to stricter insider trading regulations, insider trading decreases and informed trading in peer stock increases. Thus, for any given firm the mix of informed traders change. Hence, we next examine the effect of change in the mix of informed traders in a focal firm (due to the regulation change) on the price informativeness and liquidity of the firm. Table 9 summarizes the characteristics of the sample firms.

5.1 Changes in Stock Price Informativeness

Next, we examine the effect of insider trading regulation on the price informativeness of stocks. Our results so far mean that the insider trading regulations do not unequivocally curb

informed trading but lead to a change in the composition of informed traders and their information. Insiders, who are likely to have more precise information about their own firms, are replaced by peer-firm insiders. These informed traders do have an information advantage, but the information is likely to be noisier than that of own-firm insiders. Additionally, while insiders are required to report trades in their own stock, peer-firm insiders are not required to report their trades. Through both these mechanisms, we expect prices to be less informative after the change in regulation. On the other hand, now there could be more informed traders competing against each other. Then, through this channel, the information would get reflected incorporated in prices more rapidly, improving the price informativeness (Holden and Subrahmanyam, 1992). Thus, the overall effect of the new regulations on price informativeness is an empirical question.

If stricter insider trading reduces the amount of information that insider trades and their disclosure conveyed to the market, public news announcements such as earnings would carry more information. We measure the quantum of information released during the earnings announcement using the absolute cumulative abnormal return during the 3-day earnings announcement window. Higher values of the measure imply that more information is released during the earnings announcement window and hence prices during the rest of the quarter are *less* informative. Thus, if insider trading regulations reduce price informativeness, this measure would increase in the post-regulation period.

We have demonstrated that the cross-trading in peer firms is more profitable when the insiders' own firm has common information with its peer stocks (i.e. rest of the industry). Hence, we expect the price informativeness to reduce to a lesser extent for sub-sample of firms whose returns highly comove with the rest of the industry.

We conduct a univariate comparison of absolute cumulative abnormal return during the 3-day earnings announcement window in stocks whose returns have high versus low comovement with the industry returns in Panel B of Table 9.

Table 9, Panel B has three main insights. First, during the pre-regulation period, the stock prices of firms that have high common information with the industry are less sensitive to the earnings news. Second, the absolute earnings announcement returns are higher i.e. price informativeness is lower for both high comovement and low comovement firms. Third, the increase in absolute earnings announcement returns (i.e. decrease in the price informativeness) is lower for the firms that experience stronger cross-trading by peer managers i.e. the high comovement firms. In summary, the univariate returns comparison provides initial evidence supporting the conjecture that reduction in price informativeness is lower for firms that experience higher cross-trading by peer firm managers following stricter insider trading regulations.

We then examine the price informativeness in a regression and compare the absolute earnings announcement returns in high comovement and low comovement stocks in the pre- versus post-regulation periods using the following specification:

$$\text{Absolute Earnings Announcement CAR}_{it} = \alpha + \beta_1 \text{ Post} + \beta_2 \text{ Post X High\_Comove} + \beta_3 \text{ High\_Comove} + \beta_4 \text{ Absolute Earnings Surprise}_{it} + \text{Controls} + \varepsilon_{ijt} \quad (7),$$

where Absolute Earnings Announcement CAR_{it} is the absolute value of the 3-day earnings announcement Cumulative Abnormal Return for firm i and quarter t, measured as the compounded excess return over BSE100 index return over -1 to +1 days around the earnings announcement. We control for firm size, book-to-market ratio, and the total institutional ownership measured at the end of the previous quarter. Additionally, we include volatility, measured over the earnings announcement quarter and industry fixed effects. Further, we

control for the Absolute Earnings $Surprise_{it}$ measured as the absolute value of (earnings in quarter t – earnings in quarter t-4, scaled by market capitalization). If price informativeness during the quarter decreases after the regulation, we expect that β_1 is positive and significant. The differential impact of regulation on absolute earnings announcement CAR in case of high comovement is captured by β_2.

The results are reported in Table 10. We find that controlling for firm characteristics, information environment, and the earnings news, β_1 is positive and significant at the one percent level. The magnitude of the effect is around 0.01, which is about 20% of the pre-period mean of Absolute Earnings Announcement CAR of 0.05 for the firms for which we have identified an insider. Further, the coefficient on Post X High_Comove is negative and weakly significant. The total effect, Post + Post X High_Comove, is positive and statistically significant. Thus, after the new regulation, there is more information coming out during the earnings announcement suggesting that prices during the rest of the quarter are less informative. Increased informed trading by peer-firm insiders does not fully mitigate the effect of reduced informed trading and disclosure of trades by own insiders, even for firms with high comovement.

5.2 Changes in Stock Liquidity

We also evaluate whether the liquidity of stocks during the announcement quarter changes after the regulation. There are two opposite forces on illiquidity that arise because of the regulation. On the one hand, the reduction in informed trading by insiders in their own stock should, on average, reduce the illiquidity because of lower adverse selection. At the same time, since insiders of peer stocks continue to trade on private information profitably in each other's stocks, the regulation has encouraged the growth of a new class of informed traders in

markets, who could exacerbate the adverse selection. The observed changes in illiquidity around the regulation, therefore, reflect the net effect of these two forces.

We expect the liquidity benefits of reduced insider trading to be dampened for the sub-sample of firms that experience higher cross-trading by peer firm managers. We conduct a univariate comparison of mean illiquidity during announcement quarter of stocks whose returns have high versus low comovement with the industry returns in Panel C of Table 9.

Table 9, Panel C has three main insights. First, liquidity (illiquidity) of high comovement stocks is consistently higher (lower) than that of low comovement stocks during the pre- and post-regulation period consistent with high information spillover among firms with high common industry information. Second, liquidity improves in both, high- and low-comovement, subsamples after strengthening of insider trading regulation consistent with lower adverse selection. Third, the extent of liquidity improvement after the regulation is lower for high comovement firms i.e. for firms that experience higher cross-trading.

We then examine the illiquidity in a regression and compare the average daily illiquidity in high- and low- comovement stocks in the pre- versus post-regulation periods using the following specification:

$$\text{Average Daily Illiquidity}_{it} = \alpha + \alpha_{Industry} + \beta_1 \text{ Post} + \beta_2 \text{ Post X High\_Comove} + \beta_3 \text{ High\_Comove} + \text{Controls} + \varepsilon_{ijt} \quad (8),$$

where $\text{Average Daily Illiquidity}_{it}$ is the average of the daily illiquidity measures for firm i during an announcement quarter t, defined as the lag earnings announcement date +2 through current quarter earnings announcement date -1. We measure daily stock illiquidity using Illiq (Amihud, 2002), defined as the ratio of absolute daily returns and the product of closing price and the number of shares traded. This measure proxies the price impact of trade

and does well in capturing the actual price impact (Hasbrouck 2009). Price impact of trade combines price and quantity dimensions of illiquidity as opposed bid-ask spreads which ignores how large or small quantity is available to trade at the best bid and the best ask. We control for firm size, book-to-market ratio, and the total institutional ownership measured at the end of the previous quarter. Additionally, we include volatility, measured over the earnings announcement quarter and industry fixed effects.

β_1 captures the net effect of regulation on illiquidity for stocks with low comovement. β_2 is the incremental change for stocks with high comovement. We expect that when stocks do not comove much with the industry, the reduction in insider trading will dominate the net effect because peer firm insiders may not have tradeable information on the stock. Thus, we expect a reduction in illiquidity for low comovement stocks. In contrast, since we expect greater cross-firm trading by peer-firm insiders when comovement is high, we expect that the adverse selection caused by such informed peer trades will dampen the liquidity benefits of insider trading regulations.

We estimate Equation (8) for matched insider firms and report the results in Table 11. As expected, the coefficient on Post is negative and significant. It is around -0.052, which is substantial, at around 76% of pre-period average illiquidity. Further, the coefficient for Post X High_Comove is positive and significant. Thus, in line with our expectations, for the stocks with high comovement, the adverse selection due to increased informed trading by peer-insiders dampens the improvement in liquidity. The sum of the coefficients for Post and Post X High_Comove is statistically insignificant. Thus, after the change in regulation there is no improvement in liquidity for the high comovement sample.

Taken together, the results in Table 10 and Table 11 suggest that when insiders divert their superior information to trade profitably in peer stocks, there is a decrease in stock price

informativeness without any benefits of improved liquidity. This could be because trades by peer-firm insiders contribute to adverse selection and hence to illiquidity. But the peer-firm insider trades are not required to be disclosed and thus do not enhance price informativeness. Overall, the increase in peer firm trading appears to dampen the intended benefits of the insider trading regulation.

6. Conclusion

We construct a novel dataset of trades on the Bombay Stock Exchange (BSE) by insiders in their own and peer stocks to examine whether stricter insider trading regulations cause insiders to divert the use of their superior private information from profitable trades in their own stock to profitable trades in peer stocks. Insiders face a tradeoff between trading on the more precise information that they have regarding their own stock and the potential legal non-compliance risks. Changes in regulation that increase the costs of non-compliance alter the cost-benefit tradeoff, and thus insiders are less likely to use their private information to trade in their own stock. However, that does not mean that they cannot still profit from their information. To the extent that their private information is partly fungible to peer stocks, insiders will have greater incentives to use their information and trade profitably in peer stocks following stricter insider trading regulation. This has implications for insider trading regulations and these effects have been largely ignored in the prior literature.

We find that, when faced with stricter 2015 insider trading regulations in India, insiders trade more often and more profitably in peer firm stocks. The probability and profitability of peer-stock trades are higher for insiders with more fungible private information (proxied by greater industry comovement and higher correlation between own stock and peer stock). Further, the industry component of the abnormal profits contributes to the improved profitability of peer trades. On the other hand, insiders reduce their trades in their own stock.

Own stock trades also become less profitable after the regulation, particularly due to a decline in the firm-specific component of the profit. Thus, there appears to be a clear shift in insider trading behavior away from own stock and towards peer stock in response to insider trading regulation. This is conclusion is further strengthened by the evidence that the post-regulation profitability of peer stocks that are highly correlated with insider's own stock, is driven by the information about the own stock.

As a consequence of this shift in the nature and composition of informed trading, there is an overall reduction in stock price informativeness. Liquidity improves but only for stocks with limited opportunities for peer firm insiders (stocks with low industry comovement). For stocks with greater industry comovement, liquidity does not improve. Taken together, our findings suggest that stricter insider trading regulation encourages a different form of informed trading by insiders. Since trades in peer stocks are not required to be disclosed, insiders profit from their information, harming liquidity but there is no corresponding improvement in price informativeness. These unintended consequences of more stringent insider regulation might impede the regulators' objective of maintaining fair financial markets.

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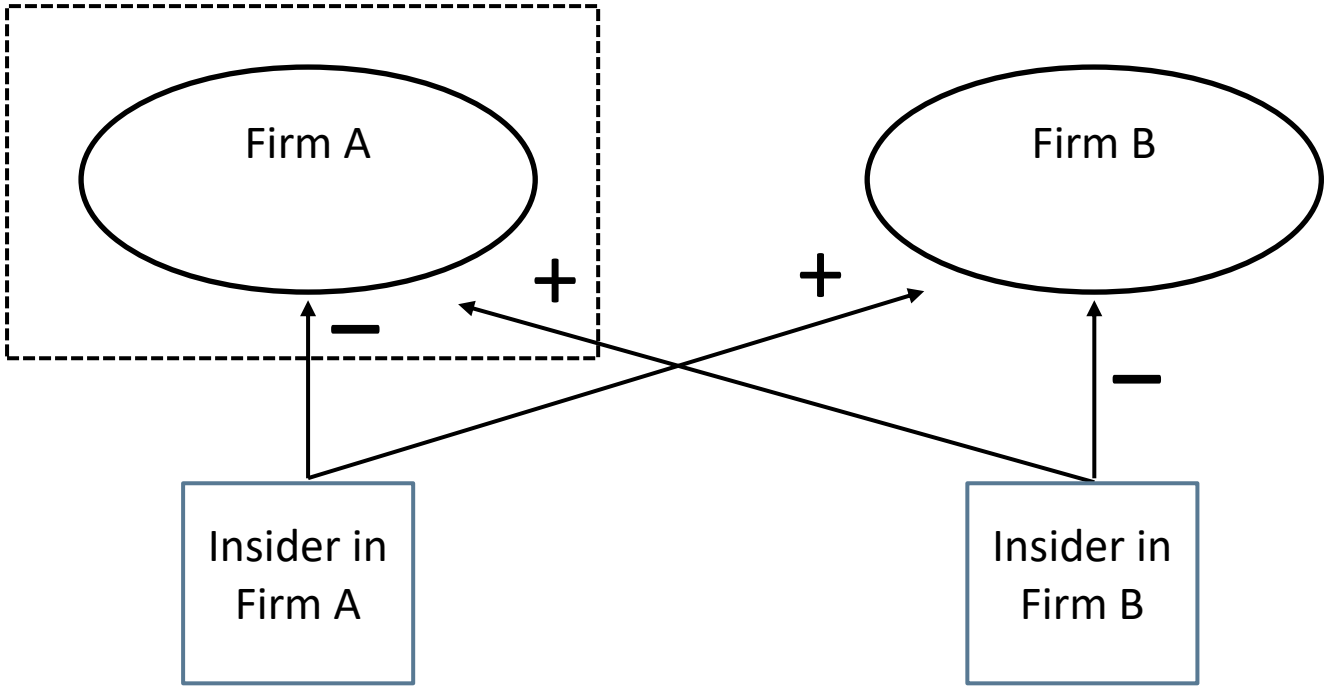
APPENDIX A: Description of Variables

Variable		Description
Dependent Variables		
Absolute Earnings Announcement CAR	=	Absolute value of 3-day earnings announcement Cumulative. Abnormal Return (CAR) which is evaluated as the compounded excess return over BSE100 index return over -1 to +1 days around the earnings announcement.
Firm-specific Component	=	Difference between Overall DGTW-Adj Ret and Industry Component.
Illiquidity	=	Daily stock illiquidity, evaluated as the absolute daily returns divided by the product of closing price and the number of shares traded (following Amihud 2002), averaged over an announcement quarter defined as the lagged earnings announcement date +2 through current quarter earnings announcement date -1. This is multiplied by a factor of 100.
Industry Component	=	Value weighted average of overall DGTW-Adj Ret of stocks within an industry.
Non-Peer-Stock-Trade $_{(1,0)}$	=	Indicator variable that equals 1 when an insider trades in a non-peer stock during her own firm's announcement quarter, and the transaction value is non-zero, and 0 otherwise.
Overall DGTW-Adj Ret	=	6 months abnormal buy-and-hold return evaluated based on the approach in Daniel, Grinblatt, Titman, and Wermers (1997) along with the modifications specified in Wermers (2004). The abnormal returns are calculated as the 6 months buy-and-hold returns of the stock minus the 6 months buy-and-hold returns of the characteristic-matched portfolio based on size, book-to-market and momentum.
Own-Stock-Trade $_{(1,0)}$	=	Indicator variable that equals 1 when an insider trades in own stock during her own firm's announcement quarter, and the transaction value is non-zero, and 0 otherwise.
Peer-Stock-Trade $_{(1,0)}$	=	Indicator variable that equals 1 when an insider trades in peer stock during her own firm's announcement quarter and the transaction value is non-zero, and 0 otherwise.
Pseudo Own-Stock Ret	=	Abnormal profitability of a hypothetical own-stock trade on the day of an actual peer-stock-trade by an insider. Abnormal profits are evaluated as 6 months buy-and-hold returns of the stock minus the 6 months buy-and-hold returns of the characteristic-matched portfolio based on size, book-to-market and momentum based on Daniel et al., 1997 and Wermers, 2004. Actual peer stock profits are replaced by hypothetical own stock profits.
Remainder Peer-Stock Ret	=	Difference between actual peer stock abnormal return (Overall DGTW-Adj Ret) and hypothetical own-stock abnormal return (Pseudo Own Stock Ret)

Variable		Description
Independent Variables		
Absolute Earnings Surprise	=	Absolute value of earnings in quarter t minus earnings in quarter t-4, scaled by market capitalization.
Book-to-Market	=	Book to market ratio.
High Comove	=	Indicator variable that equals 1 if the comovement of a stock's returns with industry returns during the pre-regulation period is above the median comovement in the sample, and 0 otherwise. To evaluate the comovement of a stock's returns with the industry, we modify the methodology used in Piotroski and Roulstone (2004). We first regress the firm's weekly stock return on the current and prior week's value-weighted industry return (excluding the firm's returns). The firm-specific measure of comovement is evaluated as the log of the ratio of R-square and (1-R-square) obtained from the regression.
High Pairwise Corr	=	Indicator variable that equals 1 if the pairwise correlation of insiders' own firm weekly return with a given peer firm's weekly return evaluated during the pre-regulation period is above the median pairwise correlation in the sample, 0 otherwise.
Institutional Ownership Fraction	=	The fraction of institutional ownership.
Non-Peer Stock	=	Indicator variable that equals 1 for firms that do <u>not</u> belong to the industry of the insider's firm, and 0 otherwise.
Own Stock	=	Indicator variable that equals 1 for insider's own firm, and 0 otherwise.
Peer Stock	=	Indicator variable that equals 1 for firms that belong to the industry of the insider's firm, and 0 otherwise.
Post	=	Indicator variable that takes a value of 1 for the period after the Insider Trading Regulation, 2015 was adopted, i.e., after January 15, 2015. It takes a value of 0 during the period between January 1,2012 and September 12, 2013 (the effective date for Companies Act 2013). The period between September 12, 2013, and January 15, 2015, is considered as a transition period and hence excluded from the analysis.
Size	=	Log of market capitalization.
Volatility	=	The standard deviation of daily market-adjusted stock returns of a firm during its announcement quarter defined as the lagged earnings announcement date +2 days through current quarter earnings announcement date -1 day.

FIGURE 1: Predicted Trading Behavior after Stricter Insider Trading Regulations



This figure shows the predicted change in informed trading following a stricter insider trading regulation. For a focal insider, say insider in Firm A, informed trading in own stock decreases while informed trading in peer firm B increases. Therefore, for a focal firm, say Firm A, there is a decrease in informed trading by own firm insiders but an increase in informed trades by insiders of peer firms.

TABLE 1: Sample Construction

The table provides details of sample construction. We examine the insider-reported trades on the Bombay Stock Exchange (BSE) over the period 2012 -2017.

		Insiders	Insider trades in own stock	Insider Firms
(i)	Total number reporting (Source: Prowess)	12,890	68,983	1,753
(ii)	Total number reporting with at least two trades and at least one odd-lot trade (Source: Prowess)	6,293	56,486	1,322
(iii)	Uniquely matched insiders (Source: Prowess and BSE data)	1,312	11,090	769
	% matched (iii)/(ii)	21%	20%	58%
(iv)	Uniquely identified (with available returns and financial data)	943	13,912*	533

* Includes smaller trades available in the BSE data but not required to be reported.

TABLE 2: Likelihood of Insider Trades in Own Stocks and Peer Stocks

This table reports results for the effect of insider trading regulation on likelihood of firm insiders to trade in own and peer stocks. The unit of analysis is insider-insider's own firm-quarter observations. The dependent variable, *Own-Stock-Trade* $_{(1,0)}$, (*Peer-Stock-Trade* $_{(1,0)}$) equals 1 when an insider trades in her own stock (peer stock) during the earnings announcement quarter of her own firm, and 0 otherwise. *Post* is an indicator variable that equals 1 during the post-regulation period, and 0 otherwise. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% level, respectively. Robust standard errors clustered at insider firm- quarter level are in parentheses. All variables are described in Appendix A.

	(1) **Own-Stock-Trade** $_{(1,0)}$	**(2)** **Peer-Stock-Trade** $_{(1,0)}$	**(3)** **Own-Stock-Trade** $_{(1,0)}$	**(4)** **Peer-Stock-Trade** $_{(1,0)}$
Post	-0.0372***	0.0091**	-0.0368***	0.0088***
	(0.007)	(0.004)	(0.007)	(0.003)
Fixed Effects	INDUSTRY	INDUSTRY	INSIDER	INSIDER
Cluster level	Insider Firm - Quarter	Insider Firm - Quarter	Insider Firm - Quarter	Insider Firm - Quarter
Observations	19,459	19,459	19,459	19,459
R^2	0.02	0.05	0.14	0.47

TABLE 3: Likelihood of Insider Trades in Own Stocks and Peer Stocks: Comovement

This table presents the effect of insider trading regulation on the likelihood of firm insiders to trade in own and peer stocks for different levels of industry comovement. The unit of analysis is insider-insider's firm-quarter. The dependent variable, *Own-Stock-Trade* $_{(1,0)}$ *(Peer-Stock-Trade* $_{(1,0)}$) equals 1 when an insider trades in her own stock (peer stock) during the earnings announcement quarter of her own firm, and 0 otherwise. *Post* is an indicator variable that equals 1 during the post-regulation period, and 0 otherwise. *High_Comove* is an indicator variable that equals 1 if the comovement of insider's own firm's stock returns with the industry returns (during the pre-regulation period) is above the median comovement in the sample, and 0 otherwise. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% level, respectively. Robust standard errors clustered at insider firm- quarter level are in parentheses. All variables are described in Appendix A.

	(1) **Own-Stock-Trade** $_{(1,0)}$	**(2)** **Peer-Stock-Trade** $_{(1,0)}$
Post	-0.0389***	0.0031
	(0.010)	(0.005)
Post X *High_Comove*	-0.0205	0.0154*
	(0.015)	(0.008)
High_Comove	0.0110	0.0313***
	(0.013)	(0.007)
Fixed Effects	INDUSTRY	INDUSTRY
Cluster level	Insider Firm - Quarter	Insider Firm - Quarter
Observations	17,690	17,690
R2	0.03	0.07
Test of Hypothesis		
Post + *Post* X *High_Comove*	-0.0594***	0.0185***
F-stat	28.42	8.371

TABLE 4: Univariate for Profitability of Insider Trades in Own Stocks and Peer Stocks

This table presents the average abnormal profitability of trades by firm insiders before and after the new insider trading regulations. Abnormal returns are measured as *Overall DGTW-Adj Returns* defined as the 6 months abnormal buy-and-hold returns calculated as 6 months buy-and-hold returns of the stock minus the 6 months buy-and-hold returns of the characteristic- matched portfolio based on size, book-to-market, and momentum, based on the approach in Daniel, Grinblatt, Titman, and Wermers (1997) with the modifications specified in Wermers (2004). The number of insider trades in each category is reported in the brackets. *, **, *** indicate significance at the 10 percent, 5 percent, and 1 percent levels, respectively for the differences. All the variables are defined in Appendix A.

Overall DGTW-Adj Returns for Insider Trades			
	Pre	Post	Post-Pre
Own	0.0294 [6,458]	0.0340 [7,454]	0.0046
Peer	-0.0255 [1,179]	0.0208 [2,276]	0.0463***
Own-Peer	0.0549***	0.0132	

TABLE 5: Profitability of Insider Trades in Own Stock and Peer Stocks

This table reports the regression results for the effect of insider trading regulation on the profitability of trades by firm insiders in their own stock and stocks of peer firms. The sample consists of trades by insiders in their own firm and peer firms. The unit of analysis is insider- stock- trade date observations. The dependent variable, *Overall DGTW-Adj Ret*, is the abnormal returns evaluated based on the approach in Daniel, Grinblatt, Titman, and Wermers (1997) along with the modifications specified in Wermers (2004). The abnormal returns are calculated as the 6 months buy-and-hold returns of the stock minus the 6 months buy-and-hold returns of the characteristic-matched portfolio based on size, book-to-market and momentum. *Own_Stock* is an indicator variable that equals 1 for insider's own firm, and 0 otherwise. *Post* is an indicator variable that equals 1 during the post-regulation period, and 0 otherwise. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% level, respectively. Robust standard errors clustered at the stock- trade date level are in parentheses. All variables are described in Appendix A.

	(1)	**(2)**
	Overall DGTW-Adj Ret	**Overall DGTW-Adj Ret**
Own_Stock	0.0661***	0.0637***
	(0.013)	(0.018)
Post	0.0417***	0.0275*
	(0.014)	(0.015)
Post X *Own_Stock*	-0.0376**	-0.0679***
	(0.016)	(0.018)
Fixed Effects	INDUSTRY	INSIDER
Cluster level	Stock - Trade Date	Stock - Trade Date
Observations	17,367	17,367
R2	0.07	0.36
Test of Hypothesis		
Post + *Post* X *Own_Stock*	0.00412	-0.0404***
F-stat	0.344	14.45

TABLE 6: Profitability of Insider Trades in Own Stock and Peer Stocks: Comovement

This table presents the effect of insider trading regulation on the profitability of trades by firm insiders for different levels of industry comovement. The sample consists of trades by insiders in their own firm and peer firms. The unit of analysis is insider-firm- trade date observations. The dependent variable, *Overall DGTW-Adj Ret,* is abnormal return evaluated based on the approach in Daniel, Grinblatt, Titman, and Wermers (1997) along with the modifications specified in Wermers (2004). The abnormal returns are calculated as the 6 months buy-and-hold returns of the stock minus the 6 months buy-and-hold returns of the characteristic-matched portfolio based on size, book-to-market and momentum. *High_Comove* is an indicator variable that equals 1 if the comovement of a stock's returns with the industry returns during the pre-regulation period is above the median comovement in the sample, and 0 otherwise. *Own_Stock* is an indicator variable that equals 1 for insider's own firm and 0 otherwise. *Post* is an indicator variable that equals 1 during the post-regulation period and 0 otherwise. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% level, respectively. Robust standard errors clustered at stock- trade date level are in parentheses. All variables are described in Appendix A.

	Overall DGTW-Adj Ret
High_Comove	0.0033
	(0.025)
Own_Stock	0.0377
	(0.023)
High_Comove X *Own Stock*	0.0635**
	(0.027)
Post	0.0365
	(0.027)
Post X *Own_Stock*	0.0026
	(0.029)
Post X *Own_Stock* X *High_Comove*	-0.0725**
	(0.034)
Post X *High_Comove*	0.0139
	(0.031)
Fixed Effects	INDUSTRY
Cluster level	Stock - Trade Date
Observations	16,309
R2	0.08
Test of Hypothesis	
Post + *Post* X *High_Comove*	0.0504***
F-stat	11.03

TABLE 7: Profitability of Insider Trades in Own Stock and Peer Stocks: Decomposition

This table presents the decomposition of insider trading profits into industry-specific and firm-specific components. The sample consists of trades by insiders in their own firm and peer firms. The unit of analysis is insider-firm- trade date observations. The dependent variable in column (1) and column (3), *Industry Component* of profits, is evaluated as the value-weighted average of abnormal profit of firms within the industry of the traded stock. The abnormal returns (*Overall DGTW-Adj Ret)* are calculated as excess buy-and-hold returns over a characteristic-based benchmark following Daniel et al. (1997). The dependent variable in column (2) and column (4), *Firm-specific Component,* is evaluated as the difference between *Overall DGTW-Adj Ret* and *Industry Component*. *Own_Stock* is an indicator variable that equals 1 for insider's own firm and 0 otherwise. *Post* is an indicator variable that equals 1 during the post-regulation period and 0 otherwise. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% level, respectively. Robust standard errors, clustered at the industry- trade date level for the regression results in Columns (1) and (3) and at stock- trade date level for regressions results in Columns (2) and (4), are in parentheses. All variables are described in Appendix A.

	(1)	**(2)**	**(3)**	**(4)**
	Industry Component	**Firm-specific Component**	**Industry Component**	**Firm-specific Component**
Own_Stock	-0.0035	0.0696***	-0.0288***	0.0925***
	(0.005)	(0.013)	(0.007)	(0.017)
Post	0.0293***	0.0124	0.0232***	0.0043
	(0.005)	(0.013)	(0.006)	(0.015)
Post X *Own_Stock*	0.0131**	-0.0507***	0.0237***	-0.0916***
	(0.006)	(0.015)	(0.007)	(0.018)
Fixed Effects	INDUSTRY	INDUSTRY	INSIDER	INSIDER
Cluster level	Industry - Trade Date	Stock - Trade Date	Industry - Trade Date	Stock - Trade Date
Observations	17,367	17,367	17,367	17,367
R^2	0.11	0.08	0.37	0.36
Test of Hypothesis				
Post + *Post* X *Own_Stock*	0.0423***	-0.0382***	0.0469***	-0.0873***
F-stat	222.2	27.27	117.1	61.25

TABLE 8: Profitability of Pseudo Own-Stock Trades

This table presents the effect of insider trading regulation on the profitability of hypothetical trades by firm insiders in their own stock and hypothetical idiosyncratic profits. This sample consists of peer trades by insiders. The unit of analysis is insider-firm- trade date observations. The dependent variable, *Overall DGTW-Adj Ret*, is the abnormal returns evaluated based on the approach in Daniel, Grinblatt, Titman, and Wermers (1997) along with the modifications specified in Wermers (2004). The abnormal returns are calculated as the 6 months buy-and-hold returns of the stock minus the 6 months buy-and-hold returns of the characteristic-matched portfolio based on size, book-to-market and momentum. The dependent variable *Pseudo Own-Stock Ret* is the abnormal profitability (evaluated as the 6 months buy-and-hold returns of the stock minus the 6 months buy-and-hold returns of the characteristic-matched portfolio based on size, book-to-market and momentum based on Daniel et al., 1997 and Wermers, 2004) of a hypothetical own-stock trade on the date and in the same direction (buy/sell) as that of an actual peer-stock trade by an insider. Actual peer stock profits are replaced by hypothetical own stock profits. The dependent variable *Remainder Peer-Stock Ret* is evaluated as the difference between actual peer stock abnormal return and hypothetical own-stock abnormal return. *High_Pairwise_Corr* is 1 if the pairwise correlation of insiders' own firm returns and a given peer firm returns evaluated during the pre-regulation period is above median, 0 otherwise. *Post* is an indicator variable that equals 1 during the post-regulation period and 0 otherwise. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% level, respectively. Robust standard errors, clustered at the stock- trade date level are in parentheses. All variables are described in Appendix A.

	(1) Overall DGTW-Adj Ret	(2) Pseudo Own-Stock Ret	(3) Remainder Peer-Stock Ret
High_Pairwise_Corr	-0.1134***	-0.0759***	-0.0375
	(0.030)	(0.027)	(0.039)
Post	-0.0610*	-0.0806**	0.0196
	(0.035)	(0.032)	(0.045)
Post X *High_Pairwise_Corr*	0.1078***	0.1159***	-0.0081
	(0.038)	(0.034)	(0.047)
Fixed Effects	INDUSTRY	INDUSTRY	INDUSTRY
Cluster level	Stock - Trade Date	Stock - Trade Date	Stock - Trade Date
Observations	2,605	2,605	2,605
R^2	0.09	0.04	0.07
Test of Hypothesis			
Post + *Post* X *High_Comove*	0.0468***	0.0353**	0.0115
F-stat	9.260	5.466	0.337

TABLE 9: Descriptive Statistics

Panel A: Matched Insider Firm Characteristics

This table reports the descriptive statistics for firms of at least one identified insider. The unit of analysis is firm-earnings quarter observations. All variables are described in Appendix A.

Variable	**# of obs.**	**Mean**	**P25**	**Median**	**P75**	**Std. Dev**
Absolute Earnings Announcement CAR	6,631	0.0523	0.0168	0.0397	0.0735	0.0463
Average Daily Illiquidity	6,631	0.0397	0.0000	0.0003	0.0037	0.1932
Size	6,631	7.8586	6.2808	7.6780	9.2026	2.1735
Book-to-Market	6,631	1.0956	0.3318	0.6898	1.4124	1.2275
Institutional Ownership Fraction	6,631	0.2809	0.0355	0.2271	0.4835	0.2523
Volatility	6,631	0.0296	0.0202	0.0277	0.0373	0.0120

Panel B: Univariate Comparison of Absolute Earnings Announcement CAR

This table presents the mean absolute earnings announcement returns of matched firms before and after the insider trading regulations for subsample of firms with high- versus low- comovement with the industry. Number of firm-quarters in each category are reported in the brackets. *, **, *** indicate significance at the 10 percent, 5 percent, and 1 percent levels, respectively for the differences. All the variables are defined in Appendix A.

Absolute Earnings Announcement CAR			
	Pre	Post	Post-Pre
High_Comove	0.0458 [1,153]	0.0501 [2,519]	0.0043***
Low_Comove	0.0512 [8,73]	0.0589 [2,086]	0.0078***
High_Comove - Low_Comove	-0.0054***	- 0.0089***	

Panel C: Univariate Comparison of Average Daily Illiquidity

This table presents the mean of average daily illiquidity evaluated over an earnings announcement quarter before and after the insider trading regulations for subsample of firms with high- versus low-comovement with the industry. Number of firm-quarters in each category are reported in the brackets. *, **, *** indicate significance at the 10 percent, 5 percent, and 1 percent levels, respectively for the differences. All the variables are defined in Appendix A.

Average Daily Illiquidity			
	Pre	Post	Post-Pre
High_Comove	0.0352 [1,153]	0.0151 [2,519]	-0.0202***
Low_Comove	0.1112 [873]	0.0420 [2,086]	-0.0692***
High_Comove - Low_Comove	-0.0760***	-0.0269***	

TABLE 10: Effects of Insider Regulation on Stock Price Informativeness

This table reports the effect of insider trading regulation on the informativeness of stock prices. The unit of analysis is firm-quarter observations. The dependent variable, *Absolute Earnings Announcement CAR*, is evaluated as the absolute value of daily excess return over BSE100 index return compounded over -1 to +1 days around the earnings announcement. *Post* is an indicator variable that equals 1 during the post-regulation period and 0 otherwise. *High_Comove* is an indicator variable that equals 1 if the comovement of insider's stock's returns with the industry returns (during the pre-regulation period) is above the median comovement in the sample, and 0 otherwise. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% level, respectively. Robust standard errors are in parentheses. All variables are described in Appendix A.

	Absolute Earnings Announcement CAR
Post	0.0091***
	(0.002)
Post X *High_Comove*	-0.0040*
	(0.002)
High_Comove	0.0010
	(0.002)
Absolute Earnings Surprise	0.0376***
	(0.007)
Size	-0.0024***
	(0.000)
Book-to-Market	-0.0008
	(0.001)
Institutional Ownership Fraction	0.0022
	(0.003)
Volatility	0.4205***
	(0.065)
Sample	Matched Insiders' Firms
Fixed Effects	INDUSTRY
Cluster	Firm - Quarter
Observations	6,631
R^2	0.08
Test of Hypothesis	
Post + *Post* X *High_Comove*	0.00507***
F-stat	11.03

TABLE 11: Effects of Insider Regulation on Stock Liquidity

This table presents the effect of insider trading regulation on the liquidity of stocks. The unit of analysis is firm-quarter observations. The dependent variable, *Average Daily Illiquidity,* is the daily stock illiquidity (following Amihud 2002) averaged over an announcement quarter defined as the lagged earnings announcement date +2 days through current quarter earnings announcement date -1 day. *Post* is an indicator variable that equals 1 during the post-regulation period and 0 otherwise. *High_Comove* is an indicator variable that equals 1 if the comovement of insider's stock's returns with the industry returns (during the pre-regulation period) is above the median comovement in the sample, and 0 otherwise. Column (1) presents the results for matched insiders' own firms. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% level, respectively. Robust standard errors are in parentheses. All variables are described in Appendix A.

	Average Daily Illiquidity
Post	-0.0520***
	(0.011)
Post X *High_Comove*	0.0536***
	(0.012)
High_Comove	-0.0439***
	(0.013)
Size	-0.0212***
	(0.002)
Book-to-Market	0.0145***
	(0.004)
Institutional Ownership Fraction	0.0293**
	(0.012)
Volatility	0.8404**
	(0.345)
Sample	Matched Insiders' Firms
Fixed Effects	INDUSTRY
Cluster	Firm - Quarter
Observations	6,631
R2	0.14
Test of Hypothesis	
Post + *Post* X *High_Comove*	0.00165
F-stat	0.0658

TABLE A.1: Profitability of Own-Stock and Peer-Stock Trades around Earnings Announcement

This table presents the results for profitability of trades by insiders in their own and peer firm stocks during high earnings-related information period and low earnings-related information period. In a given own-firm quarter, the period between t-10 to t+1 days around the own firm earnings announcement date is considered as High Earnings Information Period whereas the remaining quarter is considered as Low Earnings Information Period. The sample consists of trades by insiders in their own firm and peer firms. The unit of analysis is insider- stock- trade date observations. The dependent variable, *Overall DGTW-Adj Ret*, is the abnormal returns evaluated based on the approach in Daniel, Grinblatt, Titman, and Wermers (1997) along with the modifications specified in Wermers (2004). The abnormal returns are calculated as the 6 months buy-and-hold returns of the stock minus the 6 months buy-and-hold returns of the characteristic-matched portfolio based on size, book-to-market and momentum. *Own_Stock* is an indicator variable that equals 1 for trades by an insider in her own firm, and 0 otherwise. *Post* is an indicator variable that equals 1 during the post-regulation period, and 0 otherwise. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% level, respectively. Robust standard errors clustered at the stock- trade date level are in parentheses. All variables are described in Appendix A.

***Dependent Variable*=** **Overall DGTW-Adj Ret**	**(1)** **High Earnings Information Period**	**(2)** **Low Earnings Information Period**
Own_Stock	0.1321***	0.0611***
	(0.035)	(0.014)
Post	0.1008***	0.0313**
	(0.034)	(0.015)
Post X *Own_Stock*	-0.1071**	-0.0269
	(0.046)	(0.017)
Fixed Effects	INDUSTRY	INDUSTRY
Cluster level	Stock - Trade Date	Stock - Trade Date
Observations	1,482	15,885
R2	0.17	0.07

TABLE A.2: Profitability of Insider Trades in All Stocks

This table reports the results for the effect of insider trading regulation on the profitability of the trades by firm insiders in their own stock, stocks of peer firms, and stocks of non-peer. The unit of analysis is insider- stock- trade date observations. The dependent variable, *Overall DGTW-Adj Ret*, is 6 months abnormal buy-and-hold return evaluated based on the approach in Daniel, Grinblatt, Titman, and Wermers (1997) along with the modifications specified in Wermers (2004). The abnormal returns are calculated as the 6 months buy-and-hold returns of the stock minus the 6 months buy-and-hold returns of the characteristic-matched portfolio based on size, book-to-market and momentum. *Own_Stock* is an indicator variable that equals 1 for insider's own firm and 0 otherwise. *Peer_Stock* is an indicator variable that equals 1 for firms that belong to the industry of the insider's firm and 0 otherwise. *Post* is an indicator variable that equals 1 during the post-regulation period and 0 otherwise. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% level, respectively. Robust standard errors clustered at the stock- trade date level are in parentheses. All variables are described in Appendix A.

	(1) **Overall DGTW-Adj Ret**	**(2)** **Overall DGTW-Adj Ret**
Own_Stock	0.0380***	0.0569***
	(0.005)	(0.008)
Post	0.0068***	0.0050*
	(0.002)	(0.003)
Post X *Own_Stock*	-0.0032	-0.0448***
	(0.007)	(0.009)
Peer_Stock	-0.0104	-0.0269**
	(0.011)	(0.011)
Post X *Peer_Stock*	0.0392***	0.0414***
	(0.014)	(0.014)
Fixed Effects	INDUSTRY	INSIDER
Cluster level	Stock - Trade Date	Stock - Trade Date
Observations	105,445	105,445
R2	0.01	0.07
Test of Hypothesis		
Post + *Post* X *Own_Stock*	0.0036	-0.0398***
F-stat (*Post* + *Post* X *Own_Stock*)	0.271	20.42
Post + *Post* X *Peer_Stock*	0.0460***	0.0464***
F-stat (*Post* + *Post* X *Peer_Stock*)	11.76	11.87

TABLE A.3: Profitability of Insider Trades in All Stocks: Decomposition

This table presents the decomposition of the trading profits of insider trades (in their own stocks, peer stocks, and non-peer stocks) into industry-specific and firm-specific components. The unit of analysis is insider- stock- trade date observations. The dependent variable in Columns (1) and (3), *Industry Component* of profits, is evaluated as the value-weighted average of abnormal profit of firms within the industry of the traded stock. The abnormal returns (*Overall DGTW-Adj Ret*) are calculated as the excess buy-and-hold returns over a characteristic-based benchmark following Daniel et al. (1997). The dependent variable in column (2) and column (4), *Firm-specific Component,* is evaluated as the difference between *Overall DGTW-Adj Ret* and *Industry Component*. *Own_Stock* is an indicator variable that equals 1 for insider's own firm and 0 otherwise. *Peer_Stock* is an indicator variable that equals 1 for firms that belong to the industry of the insider's firm and 0 otherwise. *Post* is an indicator variable that equals 1 during the post-regulation period and 0 otherwise. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% level, respectively. Robust standard errors, clustered at the industry- trade date level for the regression results in column (1) and column (3) and at stock- trade date level for regressions results in column (2) and column (4), are in parentheses. All variables are described in Appendix A.

	(1) Industry Component	**(2) Firm-specific Component**	**(3) Industry Component**	**(4) Firm-specific Component**
Own_Stock	-0.0281***	0.0661***	-0.0442***	0.1012***
	(0.002)	(0.005)	(0.003)	(0.008)
Post	0.0005	0.0063***	0.0001	0.0049*
	(0.001)	(0.002)	(0.001)	(0.002)
Post X *Own_Stock*	0.0450***	-0.0482***	0.0517***	-0.0965***
	(0.003)	(0.007)	(0.004)	(0.009)
Peer_Stock	-0.0239***	0.0135	-0.0171***	-0.0098
	(0.005)	(0.011)	(0.005)	(0.011)
Post X *Peer_Stock*	0.0310***	0.0082	0.0251***	0.0163
	(0.005)	(0.013)	(0.005)	(0.013)
Fixed Effects	INDUSTRY	INDUSTRY	INSIDER	INSIDER
Cluster level	Industry - Trade Date	Stock - Trade Date	Industry - Trade Date	Stock - Trade Date
Observations	105,445	105,445	105,445	105,445
R2	0.02	0.01	0.06	0.09
Test of Hypothesis				
Post + *Post* X *Own_Stock*	0.0455***	-0.0420***	0.0518***	-0.0916***
F-stat (*Post* + *Post* X *Own_Stock*)	282	35.15	211.3	99.78
Post + *Post* X *Peer_Stock*	0.0315***	0.0145	0.0252***	0.0212
F-stat (*Post* + *Post* X *Peer_Stock*)	36.55	1.231	22.05	2.626

TABLE A.4: Profitability of Insider Trades: High Governance Firms

This table reports the results for the effect of insider trading regulation on the profitability of trades by insiders of high-governance firms. The unit of analysis is insider- stock- trade date observations. The dependent variable, *Overall DGTW-Adj Ret*, is 6 months abnormal buy-and-hold return evaluated based on the approach in Daniel, Grinblatt, Titman, and Wermers (1997) along with the modifications specified in Wermers (2004). The abnormal returns are calculated as the 6 months buy-and-hold returns of the stock minus the 6 months buy-and-hold returns of the characteristic-matched portfolio based on size, book-to-market and momentum. The dependent variable, *Industry Component* of profits, is evaluated as the value-weighted average of abnormal profit (*Overall DGTW-Adj Ret*) of firms within the industry of the traded stock. The dependent variable, *Firm-specific Component,* is evaluated as the difference between *Overall DGTW-Adj Ret* and *Industry Component*. *Own_Stock* is an indicator variable that equals 1 for insider's own firm and 0 otherwise. *Post* is an indicator variable that equals 1 during the post-regulation period and 0 otherwise. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% level, respectively. Robust standard errors clustered at the stock-trade date level are in parentheses. All variables are described in Appendix A.

	(1) **Overall DGTW-Adj Ret**	**(2)** **Industry Component**	**(3)** **Firm-specific Component**
Own_Stock	0.5020***	0.0294*	0.4727***
	(0.049)	(0.015)	(0.052)
Post	0.1765***	0.0763***	0.1002
	(0.062)	(0.017)	(0.066)
Post X *Own_Stock*	-0.3640***	-0.0334*	-0.3306***
	(0.070)	(0.019)	(0.073)
Fixed Effects	INDUSTRY	INDUSTRY	INDUSTRY
Cluster level	Stock- Trade Date	Industry - Trade Date	Stock - Trade Date
Observations	899	899	899
R^2	0.22	0.21	0.23
Test of Hypothesis			
Post + *Post* X *Own_Stock*	-0.187***	0.0429***	-0.230***
F-stat	15.68	15.27	20.53

TABLE A.5: Likelihood of Insider Trades in Own Stocks and Peer Stocks for Alternative Pre- and Post- Regulation Period

This table reports the results of the effect of insider trading regulation on the likelihood of firm insiders to trade in own and peer stocks for alternative period for pre- and post- regulation. *Extended Transition Window* (Column 1) reports the results when the period after the effective date of the Prohibition of Insider Trading Regulation i.e., post May 15, 2015 is considered as the post regulation period and the pre-regulation period is the same as before. Specifically, for extended transition window, *Post* takes a value of 1 for the sample after May 15, 2015, and 0 for the sample before September 12, 2013 (and the period between the two dates is considered as a transition period). *No Transition Window* (Column 2) reports the results when the period after the adoption date of the Prohibition of Insider Trading Regulation i.e., post January 15, 2015 is considered as the post regulation period and the period before that is considered as pre-regulation period. Specifically, for no transition window, *Post* is an indicator variable which is 1 for the sample after January 15, 2015 and 0 otherwise. The unit of analysis is insider-own firm-quarter level observations.The dependent variable, *Own-Stock-Trade* $_{(1,0)}$, equals 1 when an insider trades in her own stock during the earnings announcement quarter of her own firm, and 0 otherwise. The dependent variable, *Peer-Stock-Trade* $_{(1,0)}$, equals 1 when an insider trades in a peer stock during the earnings announcement quarter of her own firm, and 0 otherwise. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% level, respectively. Robust standard errors clustered at insider firm- quarter level are in parentheses. All variables are described in Appendix A.

	Extended Transition Window		***No Transition Window***	
	(1)	**(2)**	**(3)**	**(4)**
	Own-Stock-Trade $_{(1,0)}$	**Peer-Stock-Trade $_{(1,0)}$**	**Own-Stock-Trade $_{(1,0)}$**	**Peer-Stock-Trade $_{(1,0)}$**
Post	-0.0401***	0.0086***	-0.0326***	0.0057**
	(0.007)	(0.003)	(0.006)	(0.002)
Fixed Effects	INSIDER	INSIDER	INSIDER	INSIDER
Cluster level	Insider Firm - Quarter	Insider Firm - Quarter	Insider Firm - Quarter	Insider Firm - Quarter
Observations	18,368	18,368	26,084	26,084
R^2	0.15	0.47	0.13	0.45

TABLE A.6: Profitability of Insider Trades for Alternative Pre- and Post- Regulation Period

This table reports the effect of insider trading regulation on the profitability of insider trades in own and peer stocks for alternative period for pre- and post- regulation. *Extended Transition Window* reports the results when the period after the effective date of the Prohibition of Insider Trading Regulation i.e., post May 15, 2015, is considered as the post regulation period and the pre-regulation period is the same as before. Specifically, for extended transition window, *Post* takes a value of 1 for the sample after May 15, 2015, and 0 for the sample before September 12, 2013 (and the period between the two dates is considered as a transition period). *No Transition Window* reports the results when the period after the adoption date of the Prohibition of Insider Trading Regulation i.e., post January 15, 2015, is considered as the post regulation period and the period before that is considered as pre-regulation period. Specifically, for no transition window, *Post* is an indicator variable which is 1 for the sample after January 15, 2015 and 0 otherwise. The unit of analysis is insider- stock- trade date observations. The dependent variable in column (1) and column (3), *Industry Component* of profits, is evaluated as the value-weighted average of abnormal profit of firms within the industry of the traded stock. The abnormal returns (*Overall DGTW-Adj Ret)* are calculated as excess buy-and-hold returns over a characteristic-based benchmark following Daniel et al. (1997). The dependent variable in column (2) and column (4), *Firm-specific Component,* is evaluated as the difference between *Overall DGTW-Adj Ret* and *Industry Component*. *Own_Stock* is an indicator variable that equals 1 for insider's own firm and 0 otherwise. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% level, respectively. Robust standard errors, clustered at the industry- trade date level for the regression results in Columns (1) and (3) and at stock- trade date level for regressions results in Columns (2) and (4), are in parentheses. All variables are described in Appendix A.

	Extended Transition Window		***No Transition Window***	
	(1)	**(2)**	**(3)**	**(4)**
	Industry Component	**Firm-specific Component**	**Industry Component**	**Firm-specific Component**
Own_Stock	-0.0242***	0.0704***	-0.0125**	0.0776***
	(0.007)	(0.018)	(0.006)	(0.014)
Post	0.0190***	0.0091	0.0134***	0.0277**
	(0.006)	(0.015)	(0.005)	(0.013)
Post X Own_Stock	0.0182**	-0.0732***	0.0095	-0.0409**
	(0.008)	(0.019)	(0.006)	(0.016)
Fixed Effects	INSIDER	INSIDER	INSIDER	INSIDER
Cluster level	Industry - Trade Date	Stock - Trade Date	Industry - Trade Date	Stock - Trade Date
Observations	16,104	16,104	22,267	22,267
R^2	0.39	0.37	0.32	0.32
Test of Hypothesis				
Post + *Post* X *Own_Stock*	0.0373***	-0.0641***	0.0229***	-0.0131
F-stat	64.37	28.33	41.11	1.857

TABLE A.7: Profitability of Insider Trades for Alternative Return Horizon

This table reports the results for the effect of insider trading regulation on the profitability of trades by insiders evaluated over a return horizon of 3 months. The unit of analysis is insider- stock- trade date observations. The dependent variable, *Overall DGTW-Adj Ret*, is 3 months abnormal buy-and-hold return evaluated based on the approach in Daniel, Grinblatt, Titman, and Wermers (1997) along with the modifications specified in Wermers (2004). The abnormal returns are calculated as the 3 months buy-and-hold returns of the stock minus the 3 months buy-and-hold returns of the characteristic-matched portfolio based on size, book-to-market and momentum. The dependent variable, *Industry Component* of profits, is evaluated as the value-weighted average of abnormal profit (*Overall DGTW-Adj Ret*) of firms within the industry of the traded stock. The dependent variable, *Firm-specific Component,* is evaluated as the difference between *Overall DGTW-Adj Ret* and *Industry Component*. *Own_Stock* is an indicator variable that equals 1 for insider's own firm and 0 otherwise. *Post* is an indicator variable that equals 1 during the post-regulation period and 0 otherwise. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% level, respectively. Robust standard errors clustered at the stock-trade date level are in parentheses. All variables are described in Appendix A.

	(1) **Overall DGTW-Adj Ret**	**(2)** **Industry Component**	**(3)** **Firm-specific Component**
Own_Stock	0.0596***	-0.0175***	0.0772***
	(0.013)	(0.005)	(0.013)
Post	0.0386***	0.0075*	0.0311***
	(0.012)	(0.004)	(0.011)
Post X Own_Stock	-0.0617***	0.0144***	-0.0762***
	(0.013)	(0.005)	(0.013)
Fixed Effects	INSIDER	INSIDER	INSIDER
Cluster level	Stock - Trade Date	Industry - Trade Date	Stock - Trade Date
Observations	17,367	17,367	17,367
R^2	0.30	0.29	0.30
Test of Hypothesis			
Post + Post X Own_Stock	-0.0231***	0.0219***	-0.0451***
F-stat	10.08	59.09	35.10